

V.—Notes on Assam Butterflies.—By WILLIAM DOHERTY, Cincinnati, U. S. A. Communicated by THE SUPERINTENDENT OF THE INDIAN MUSEUM.

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(With Plate X.)

A collection of butterflies made on the Upper Assam frontier between August and December, afforded material for the following notes. The specimens were taken partly in the hills beyond Margherita, on the border of the independent Naga country, fifty miles due south of Sadiya and the Brahmaputra, and partly on the Dibang and Dikrang rivers north of Sadiya. The season was a very poor one, the cold weather commencing earlier than usual. The number of species taken was so small, and some groups were so poorly represented, that I have thought it best to postpone publishing a list of the butterflies of the district till after my return there next spring.

The dry-season, non-ocellate brood of *Mycalasis*, *Melanitis*, *Junonia*, etc., appeared about the end of September, and none but rubbed and ragged individuals of the wet-season brood were seen flying after that date. *Amoma amathusia*, a morphid, turned out to be also dimorphic, as indeed might have been expected. My theory of the effect of drought and humidity (somewhat like that of heat and cold on certain European species) on the shape and ocellation of these butterflies has now received confirmation from various sources. In Eastern Java and the neighbouring islands of Sumba, Sumbawa, and Timor, the seasons are the reverse of those in India, the winter months—December, January and February—being the rainy ones. I found the broods of the *Satyridae* similarly reversed there, the wet-season form coming out late in the autumn, and the dry-season one in the spring. This is of course only indirect evidence, but direct evidence has not been wanting. Mr. de Nicéville, who early adopted my views on this subject, some time ago reared *Mycalasis mineus* from the eggs of *M. visala* and has lately bred both forms of *Melanitis leda* under natural conditions from the eggs of the ocellate one. This, however, took place at the time of the change of monsoon. At any other time it must be very unusual for both forms to come from the same parent. Two years ago in the early part of the dry season in the island of Sumbawa, I succeeded in obtaining both *Melanitis leda* (*determinata*) and *ismene* from the eggs of *leda* by keeping a wet sponge in the box in which the former species was reared. I particularly recommend this experiment to naturalists living in the East, as *Melanitis* lays its eggs with unusual facility in captivity, and the larva feeds on young growing rice, which is always obtainable. My

chief difficulty with this and other species resulted from my constant change of abode. The dimorphism of many other species yet remains to be demonstrated by breeding. But in these cases, the evidence of the prehensores, in itself irresistible, added to the thousand signs and tokens of identity obvious to any unbiassed field-naturalist, settles beforehand what the results will be.

Another group in which much may be done by breeding is that of the *Eupheas* included by Mr. Butler in *Salpinx*. Mr. Moore has described a number of Assam species forming the majority of his genus *Pademna*. These are not local varieties. In a single glade in the forest one may find them all, together with dozens of intermediate forms. I have collected species of *Salpinx* in various regions from Malabar to Timor, and even in the smaller islands, where *Eupheas* of other types are among the most constant of insects, they varied to a remarkable extent. In Upper Assam, where *midamus* is the dominant *Euphea*, the *Pademnas* more or less resemble that species, and after various fluctuations in the border-country between *midamus* and *core*, they finally assume, in Lower Bengal, a tolerably fixed and constant form (*kollari*) as a mimic of the latter.

In general, however, it seems to me that the results expected from breeding will never be realized, and the formula now much in vogue among lepidopterists—"these forms may be only varieties of —— but till careful breeding has proved that such is the case, we prefer to keep them distinct"—is about as dangerous as can well be imagined. The burden of proof is thus thrown on the unfortunate breeder, and the describer feels that he can safely neglect the ordinary means of proving a species, examination of a series of both sexes from more than one locality, and an attempt to associate some structural peculiarity of form, sex-mark or prehensores, with the proposed species. The *Pieride* have especially suffered in this regard, and in particular *Terias*, *Ixias*, and *Teracolus* have been thus reduced to confusion thrice confounded. Breeding can probably accomplish little with such genera. A group of these butterflies, sitting together on the wet sand, will, in three cases out of four, consist of but one variety, varying little; or, if there is another present, it will usually appear quite distinct. The next stream-bed may contain quite another breed. There is no reason for supposing that these varieties would not, in a majority of cases, breed true. It would be only now and then that the breeder, having overcome the great and greatly underrated (at least in the moister parts of the Eastern tropics) difficulties of rearing a new generation, will find any great variation in his specimens. But even this will prove nothing, because hybridism, which undoubtedly takes place occasionally between butterflies unques-

tionably distinct, must play a great part in such unstable races as those of *Terias*. The results of Mr. de Nicéville's previously mentioned experiment with *Melanitis* (though not, I think, those of mine) may with apparent justice be attributed by some to this cause. It is not by breeding that species like those of *Terias* described by Mr. Moore from Mergui will be invalidated. On examining the forms of different regions, one observes that the genus varies similarly almost everywhere, that the races have no well-marked habitat, and that every fresh locality and season adds links connecting them. The cutting down of forests seems to produce a general amalgamation of varieties which perhaps bred truly before. *Leias* is a much more variable genus in the scrub jungles of Mount Abu, than in the high forests of Burma. In the open country around Calcutta and Rangoon, there is an inconstancy in the specimens of *Terias* which will rarely be found in the neighbouring tracts still left in their original stato. The plants these butterflies feed on, instead of growing here and there in open spaces in the forest, are spread uniformly over extensive districts, and the wandering habits thus originated lead to hybridism and the obliteration of local races. The varieties of *Teracolus*, which are, so far as my experience goes, confined to dry, open country, are by no means so locally true as those of the forest-haunting genera.

It was perhaps the general destruction of forests in the long-settled parts of the East-India, China, Java—whether by the agency of nature or by that of prehistoric man, that gave rise to seasonal dimorphism in the *Satyridae*. In the wet, dark woodland, their ocelli served them as a protection. Then came the change; the country was partly deforested, and, instead of the former uniformly damp climate, there was a long dry season in which the rank vegetation withered, the sunlight entered everywhere, and the ocellate butterflies were rendered conspicuous. Some species disappeared from the regions thus affected, while others lost their ocelli and assumed the angular shape and dull neutral colouring of dry leaves, and so survived. In the less variable climate of the equatorial regions, this has rarely taken place, and generally only the ocellate broods are found there. And in desert regions, instances may perhaps occur where the ocellate form has altogether disappeared.

Other interesting examples of the effect of environment on insect life may be mentioned. The large dark form of *Hypolimnas bolina* called *jacintha* occurs along with the typical race in many neighbourhoods. But I have generally taken *jacintha* in shady jungle, while the other variety may be common in the dry, open country half a mile away. In Assam I observed a remarkable case of similar change in the female of *Appias hippodiles*. The normal form is dark above and

below, and but slightly clouded with whitish and dirty yellow. It was usually taken in the forest, moving slowly about in the deep shade, or lying *perdue* among the leaves. The other was almost as brightly coloured with pure white and rich yellow as the male, differing chiefly in the absence of the subapical yellow spot on the forewing below. Like the male it was always flitting up and down the sunny paths at the edges of the wood, only alighting from time to time for a moment or two. Intermediate specimens occurred, and there was no possibility that the species could be different; but the forms were so unlike that they might almost claim to be called dimorphic. I might have hesitated to adopt the conclusion that the differences corresponded with, or perhaps resulted from, the difference in station and habits, if I had not observed precisely the same thing in *Appias nero* in Borneo and the Malay Peninsula. Here again a female almost as richly-coloured as the male,* flies about with it in the sunlight, and a dusky, dull orange form lies hidden in the woods. But it is possible that these differences in the female may correspond with those very slight ones in the male on which Mr. Butler has based his *Appias figulina*, and that two distinct species are in question.

In *Euthalia* and its allies, great differences exist in allied species in the costal vein of the forewing, which in some species is free, and in some anastomosed with the first subcostal branch. I here give a list of the species taken in Assam, and those in the Indian Museum, arranged with reference to this peculiarity :

With the costal vein free,

Symphædra nais,
Lexias teuta,
Lexias teutoides,
Lexias recta,

* Unless my memory fails me, Mr. Forbes, in his "Wanderings in the Eastern Archipelago," observes that the females of *Belenois*, *Catopsilia*, *Appias*, and *Hebomoia* are more conspicuously coloured than the males. Seen against the white floor of a cabinet-drawer, or against a dusty road, they may be, but white backgrounds are not to be found in the jungle as nature made it. There the male of *Appias nero* goes by like a flash of living fire, and the pure white of the male of *Appias leis* or the green-white of the male of *Catopsilia* are of a brightness almost luminous. The dark variegations of the female obviously mitigate their brilliancy. Besides, even the brightest-hued females are more retiring and fond of the shade than the males are, and hence less obvious. In all probability the female is only more conspicuous than the male in such extraordinary species as that justly called *Hypolimnas anomala* by Wallace, and perhaps in a few such *Lyceinidæ* as *Biduanda thesmia* and *Catopocilina delicatula*.

Dophla evelina,
Dophla derma,
Dophla ? dunya,
Euthalia lubentina,
Euthalia phemius, (a mimic),
Euthalia aconthea,
Euthalia jama,
Euthalia telchinia, (a mimic),
Euthalia kesava,
Euthalia vasanta,
Euthalia garuda,
Euthalia ? francis,
Euthalia ? sahadeva,
Euthalia ? anyte,
Euthalia ? patala,
Euthalia ? nara.

But of these, one out of five specimens of *nara* and *patala* had the costal vein anastomosed. And while all the seventeen males of *kesava* examined had no anastomosis, it was invariably present in the eighteen females placed under this species in the Calcutta Museum.

With the costal and first subcostal veins united.

Euthalia ? durga,
Lexias ? dirtea,
Lexias ? cyanipardus,
Felderia lepidea, (apparently a protected species),
Felderia macnairi, (apparently protected),*
Felderia iapis,
Felderia andersonii, (apparently protected),
Felderia satropaces, (apparently protected),
Felderia cocytina,
Tanaëcia pulasara,
Tanaëcia cibaritidis,
Tanaëcia nicevillei, (a mimic),
Tanaëciaj ahnu,
Tanaëcia adima,
Tanaëcia apiades,
Tanaëcia puseda,
Tanaëcia ? anosia.

* It is mimicked by a new and remarkable species of *Herona* (?) of which both sexes were taken by me in Borneo, and are now in Mr. Neumoegou's possession.

In *durga* one out of six males had no anastomosis, and similar cases occurred in *dirtea* and *cyanipardus*, and apparently in *satropaces*. It is obvious that this feature is not absolutely constant. I have a specimen of *Symphædra dirtea*, female, in which no less than three very conspicuous anastomoses occur, the costal vein being united with the first subcostal branch, the latter with the second, and that with the third. The variation in *Prothoë* is mentioned below. Two years ago I made a list of the Malayan species similar to the above, and it exhibited similar irregularities.

The specimens described below are in Mr. Neumoegen's collection, unless the contrary is stated.

Family SATYRIDÆ.

MYCALESTIS (SADARGA) CHARAKA, Moore, (*oculata*). Margherita, only the ocellate form taken.

LETHE NAGA, n. sp. Pl. X, Fig. 4, ♀. FEMALE, above dark fuscous. *Forewing* with a broad white oblique band from the costa (near which it is broader and whiter) to the submedian, above which it is suddenly bent downwards, passing close by the end of the cell but not touching it, its inner border distinct, its outer diffused. *Hindwing* with two pale submarginal lines, the ocelli showing through the wing, especially the white pupil of the fifth. *Below* uniform light fuscous-brown with a slight bronzy lustre. *Forewing*, base unmarked except by a very obscure darker line across the cell, the white band as above, two straight pale submarginal lines and five perfect subequal ocelli (ringed with pale violet), set in nearly a straight line between the lower median and the lower subcostal branch. *Hindwing*, with two irregular transverse darker lines placed unusually close together, and enclosing a narrow space obscurely glossed with violet. They originate below the costal vein, the inner crossing into the cell at the origin of the upper discocellular, and continuing parallel with it to the hind margin of the cell halfway between the forkings of the median vein, continued obscurely through the submedian space. The outer line runs in a parabola from the costal vein to the upper median, skirting but not touching the end of the cell, and, crossing the base of the upper median space, disappears above the last ocellus. Ocelli six, all large, perfect, with white pupils surrounded by black and ochreous and set in a large violet-whitish ring. The first is within the line of the others, and is extremely large, the next three subequal, the next larger, the sixth geminate, with two separate white pupilled black spots in a yellow field. Two wavy submarginal pale lines.

A single female, near Margherita. It is very large—about three and a half inches in expanse. The hindwing has almost no outer angle, the forewing has the outer margin straight (rounded in *verna*, etc.) and the lower angle not cut away (as in *hyrnia*). The last bifurcation of the median vein of the hindwing takes place a little before the end of the cell. The species has no near allies. *Lethe margaritæ*, Elwes (*Neorina** *margaritæ*, Marshall and de Nicéville), which it apparently connects with the other *Lethes*, obviously differs in the white band of the hindwing below, and the white scales diffused over the under surface. As in *margaritæ*, the white band of the forewing is probably absent in the male.

Family ELYMNIADÆ.

DYCTIS PEALII, Wood-Mason, Pl. X, Fig. 3, ♀. Sadiya and Margherita. The FEMALE differs greatly from the male in this handsome species. The tails are much longer than in the male—longer even than in *Elymnias caudata*. Above, the wings are tinted with blue instead of violet. Forewing with the subcostal band very obscure, the cell dark, the disc pale. Hindwing with a conspicuous rufous-orange anal spot occupying the entire breadth of the submedian space, the violet submarginal band of the male replaced by a short bluish fascia thence to the large discal and apical pale area. Below, the entire forewing, except the cell and the outer margin, is clouded with large violet-white striae, and so is the apical and part of the discal area of the hindwing.

Family MORPHIDÆ.

ÆMONA AMATHUSIA, Hew. (*pealii*, W.-M.). *Æ. pealii* appears to be the wet-season form of *amathusia*, differing only in the less acute and falcate forewing, the more distinct ocelli, and brighter colouring below, the usual differences between seasonal forms in India. I took two specimens of *pealii* near Sadiya in September. The outer margin of the forewing was convex throughout, but the apex was slightly more acute than in the type. On the first of December, I caught a single ragged specimen of *amathusia* near Margherita, apparently quite typical.

* That species is of course a *Lethe*. The true *Neorinas* are singular insects, and can only be retained in the *Satyridae* on account of the difficulty of putting them anywhere else. I have often observed *N. lowii* in Borneo, the Malay Peninsula, and Eastern Java (where, however, the local representative may be distinct). It is continually changing its perch, flitting round and round the passers-by, and alighting with the wings partly or wholly open. When flying, it has the strongest possible resemblance to *Papilio helenus*, and it may possibly be advantageous for a scarce, rather weak-flying insect of morphid or satyrid affinities to resemble a common *Papilio* of powerful and irregular flight.

Family APATURIDÆ.

POTAMIS (or APATURA) ULUPI, n. sp. Pl. X, Fig. 2, ♂.

MALE, *above, forewing*, black, quite unglossed, markings light ochreous-fulvous, the base, costa, hind-margin, and a few submarginal touches diffused rufous-brown; two small light ochreous spots above the radials, the upper largest; an obliquely transverse fulvous macular band from the subcostal vein to the lower angle, the first three spots being elongate-quadrate, separated only by veins, the last with a pale space beyond it, the fourth well separated from the first three, outwardly incised, the fifth subquadrate, diffused, close to the outer margin, with a large black spot partly enclosed by its inner border, the sixth slender, lying along the margin of the interno-median space; another transverse band from the upper edge of the cell to the submedian vein sloping obliquely outwards, and divided into three parts by the median vein and its lower branch, occupying the middle half of the cell (with a diffused streak at the lower angle, almost separated from it by an oblique black crescent), the basal half of the lower median and half of the interno-median space. *Hindwing* ochreous-fulvous, the abdominal margin as far as the lower, and in the middle of the disc the upper median branch, covered with diffused black scales, the apical part also sordid, the veins dark, the marginal line and a broader submarginal line thickened at the crossing of the veins, black, within which is a line of five partly united dark spots diminishing anally to mere streaks. A large and distinct black spot discally in the lower median space.

Below, forewing, paler tawny, the black spaces above replaced by dusky fulvous ones, except a large black spot in the lower median space, and a diffused blackish one below it, near the lower angle of the wing. The two subapical spots, and a touch on the costa beyond the cell, lilac-white. *Hindwing* light fulvous, the base slightly glossed, pale; a large ocellus pupilled with purple in the lower median space; a lustrous lilac-white band across the wing discally, bordered inwardly by a darker ferruginous band broadest near the costa; a submarginal ferruginous line, within which are a few obscure lilac-white touches, between which and the lilac band lie four good-sized lilac-white spots and some ferruginous touches.

One male taken by Lieut. Hartert on the Dikrang near Sadiya, another by me at Kobong between Sadiya and Margherita. One or two others were seen.

This butterfly has no near allies. In general appearance it is something like *Dilipa morgiana* or *Sephisa dichroa*. In its small body and rather weak flight it resembles *Apatura* (*Eulaceura*) *osteria*, and if

the female turns out to have two parallel raised processes on the under-side of the abdomen, as in that species, it might be classed with it. But it seems nearer the European *iris*, though so differently coloured. The border is less serrate, the forewing more falcate, and its costa longer than in any other *Apatura*. The abdominal margin of the hindwing is long and the outer margin not much rounded. The radial veins of the forewing are unusually approximate basally, and the last bifurcation of the subcostal is unusually near the margin. It is remarkable that the varieties of *Apatura namouna* and *Dilipa morgiana* found in the Naga Hills, judging from the specimens in the Indian Museum, differ from Sikkim specimens and somewhat resemble this species in their smooth-bordered elongate wings, weak bodies, and dull colouring.*

PROTHOE REGALIS, Butler, var. One ragged male taken near

* In a paper which appeared in this Journal in May, 1886, the corrections to which arrived too late for publication, *Potamis* (*Apatura*) *namouna* was by a clerical error placed among the *Nymphalidae*, instead of among the *Euripinae* at the top of the preceding page. This group, like the *Dolichallinae* and *Charaxidae* (which by a similar error were placed between the *Apaturidae* and *Nymphalidae*) seem intermediate between the *Apaturidae* and *Satyridae*. As *Charaxes* is partially connected with the *Euripinae* by *Prothoe* and *Mynes* it had better be placed as a sub-family at the end of the *Apaturidae*. The name *Bybliade* must be substituted for *Eurytelide*. *Kallima*, it seems, is a true apaturid, near *Rhinopalpa* and *Hypolimnas*. There is no important difference between the *Junonia* and *Apatura* groups, though the *Vanessa* group seems distinct enough. So much confusion arises from the use of the names *Nymphalis* and *Apatura*, that it is a pity that they cannot be dropped altogether. The *Apaturidae* might then stand as the *Vanessidae*, the *Nymphalidae* as the *Neptidae*. The latter including *Limenitis*, *Adelpha*, *Neptis*, *Euthalia*, *Parthenos* and their allies is a well separated group; the former can only be separated from the *Satyridae* and *Morphidae* by an artificial line. The long series of genera from the most primitive morbid to the highest apaturid (*Cynthia* or *Cethosia* for instance) forms almost an unbroken chain. The anomalous genus *Pseuderyolis*, in which the forelegs of the female, though small, are quite perfect, might be formed into a separate family, or subfamily. The undescribed female of *P. avesta*, which exhibits this peculiarity, has but little resemblance to the male, but is a close mimic of *Precis iphita*.

Libythea seems more allied to *Hanadryas* and the *Neotropidae* than to the *Pieridae*. Of the *Erycinidae*, the American *Lemontinae* (with their reticulate eggs) seem very much nearer the *Lycaenidae* than their Eastern allies are, though no doubt all three are related. The arrangement adopted with the *Hesperiidae* cannot stand, and I have altogether remodelled it. The statement that the enclosed spaces (laterally) on the eggs of *Lycaenidae* were tetragonal was inadvertent. They are trigonal, tetragonal, hexagonal, or wholly irregular, according to the genus and sub-family. My work on eggs and young larvae still progresses, and on account of the great number of genera covered, it may, I hope, prove a useful supplement to the labours of Scudder and Edwards.

Margherita, and one seen near Sadiya. The former agrees with *regalis* in the dusky underside, and the very broad blue band and five blue spots of the forewing above, but the hindwing and the base of the forewing have an obvious violet gloss, though they are not, as in *angelica*, powdered with bluish-white scales. The costal and first subcostal veins of the forewing are well separated. Mr. de Nicéville thought that this occurred only in *P. caledonia* (*Mynes calydonia*, Staudinger). But *P. angelica* has the veins sometimes free and sometimes united.

Family NYMPHALIDÆ.

TANAËCIA ADIMA, Moore. Margherita. This species has the hindwing sometimes wholly brown, sometimes with a narrow macular band of blue over three or four spaces marginally. These and intermediate forms are all found in the same locality. I am inclined to think the species distinct from *apiades*, though very near it.

Family LYCENIDÆ.

Sub-family LYCENINÆ.

PITHECOPS FULGENS, n. sp., Pl. X, Fig. 6, ♂. MALE, above black, forewing with the cell, the interno-median space and the disc to the lower radial, resplendent cyaneous blue in some lights, dull violet in others, the black border wide, extending one-third towards the base. Hindwing similarly blue from the lower subcostal to the submedian, the black border somewhat narrower, especially towards the anal angle. Cilia of hindwing whitish except at the ends of the veins. FEMALE, above blackish, the costa and outer margin of the forewing darker. Cilia of the forewing pale, of the hindwing white.

Below, both sexes pure white, a very slender dark marginal line, a narrow submarginal white band containing a line of six minute dark transverse streaks in the forewing and five in the hindwing, within which is a narrow transverse ochreous-brown fascia very clearly defined (in the hindwing by an obscure dark line on its inner border), extending across the whole breadth of the forewing and on the hindwing from the upper subcostal to the submedian vein. Traces of slender discal streaks in the forewing near the lower angle within the ochreous band. Apex of forewing obscured with black scales, hindwing with a large and conspicuous subapical black spot extending from the costa to the lower subcostal vein.

Margherita, where it perhaps takes the place of *P. hylax*. According to Mr. de Nicéville, that species is in Sikkim much commoner than *Neopithecops*, which I did not see in Assam at all. But in the Chittagong

Hill Tracts, at Sandoway and Bassein in Burma, in Tenasserim, and in the Malay Peninsula, *Pithecopa* is the rarer form. In Java it is *Neopithecopa* that is rare, another instance of its close faunal resemblance to the Himalayas. In the Celebes, I did not observe any *Neopithecopa*, but a large protected *Pithecopa* (*P. phoenix*, Röber) is very common and conspicuous. On the other hand, *Neopithecopa* seems to occur alone in Malabar (where I found it as far north as the Gersapa Falls in North Kanara), and Ceylon, and also, so far as my experience goes, in the islands of Lombok, Sambawa, and Sumba east of Java.

The genera differ in many important points. As regards prehensores, the clasp (*harpago*) of *Neopithecopa*, seen from the side, is simply clavate at the tip, while that of *Pithecopa* is long and slender and ends in two opposing points like a pair of pincers. As to the egg, in that of *Neopithecopa* the raised lines form triangles laterally, in that of *Pithecopa* quadrangles. Both genera are apparently more or less protected, and are mimicked by certain rare species of *Logania* (*Gerydinae*) and *Cyaniris* (*Lycecinæ*).

Sub-family PORITINÆ.

MASSAGA HARTERTII, n. sp., Pl. X, Fig. 1, ♂. MALE, above black, markings in some lights lustrous sea-green, in others more or less bluish, the tips of the scales being blue and slightly bent downwards. *Forewing* with six submarginal spots, the upper five small and subequal, arranged in a linear series, the lower slightly nearer the base, oblong and much larger than the others; a slender oblique fascia beyond the cell, divided by the radials into three parts, the lowest longest; a stripe along the lower side of the median vein, extending to the base, a small part of it lying beyond the lower median branch, which divides it; beyond this a wider transverse discal spot, divided by the middle median into two portions outwardly dehiscient; another stripe along the hind margin almost from the base, the outer end inclined upwards, with a minute spot above its termination, separated from it by the internal vein. *Hindwing* with a large pale costal area, a tuft of long hairs, appressed in the direction of the apex, on a gland which forms a raised elliptical line on the underside above the origin of the first subcostal vein; submarginal spots four, a diffused one extending from the median halfway to the submedian vein, a large obliquely-semicircular one dark in the middle, in the lower median space, a narrow crescent close to the marginal black line in the upper median space, and a small diffused spot in the next space, partly united with the upper discal spot. Discal spots three, one occupying the submedian space from its base, constricted in the middle, the clavate end occupying

the whole breadth of the space; beyond this two spots of moderate size in the median spaces discally. *Below* rufous-brown with a slight bluish gloss. *Forewing* with a broad white band beyond the cell, from the costa (where it is narrowest) almost to the hind margin; beyond it a broad space of darker, richer brown, then a row of seven delicate whitish transverse submarginal streaks, of which the upper three are most distinct, crescent-shaped, the others obscure and irregular. Beyond these a paler space, with three whitish streaks, parallel with and close to the upper three of the inner series. Margin chestnut brown, cilia chiefly light. *Hindwing*, basal part unmarked, a broad white band crossing the wing from the costa, occupying the outer third of the cell, its inner margin well defined, and but slightly irregular. The disc is covered with large rufous-brown markings in two very irregular series, the first four (those above the radial) on a white ground, the others on a ground obscurely clouded with violet and whitish scales. Two of these spots in the inner series and the median spaces, are much larger than the others, the outer one quadrate. A dark wavy outer discal line extends on a white ground to the upper median, where it is interrupted, and from there to the anal angle on a whitish ground. Marginal line orange-brown, bordered inwardly by a silvery line, between which and the wavy discal line are, in the upper median space a blackish area, in the lower median space a gray area, and thence to the anal angle a blackish line inwardly bordered with reddish. Cilia basally grey, outwardly dark.

From *Poritia phalena*, Hewitson, (Singapore), of which it seems to be the northern representative, it differs in the narrow streak below the cell in the forewing, with the bifid spot beyond it, and in the long mark in the hind margin. The hindwing below is quite different, much less white, the discal spots larger and of the general ground-colour, the submarginal spots absent and the apical rufous-brown space greatly reduced.

In the right forewing the first subcostal branch is wholly absent. This interesting aberration may be of frequent occurrence in this group, and may have been the cause that Moore, Felder, and Distant passed over this vein in their descriptions of the genus.

The egg probably agrees with that of the other species of the subfamily. It is a truncate pyramid, the base somewhat convex, nearly twice as long as wide; a horizontal apex, two vertical and two sloping sides, the former trapezoidal, reticulate near their upper edges, the latter and the apex nearly square, delicately reticulate. In the ovarian tubes of the female, these eggs are found in pairs, attached by their bases. Along with those of *Liphyra brassolis*, they are the most remarkable eggs in the family.

The chrysalis somewhat resembles those of the *Erycinidæ* and strikingly illustrates the singularity of the group. It is suspended, not girt, but rigidly inclined towards the surface of the leaf. It is less compact in form than that of other *Lycenidæ*, and is studded with bristles. Of these a number on the side of the head are white, with two black ones on each side of the top of the head, and one black one on each side of the thorax above the thoracic angle. The second, third, and fourth abdominal segments have each a lower white and an upper black bristle approximate laterally, while the last segments have a number of white lateral and of black subdorsal ones. The ground colour is ochreous much marked with dark, especially on the upper surface of the abdomen, each segment having a black line near its hind margin, except the first which has two distinct black spots dorsally. The wing-covers are veined and bordered with brown.

I name this species after my fellow traveller in Assam, Lieutenant Ernst Hartert, the ornithologist and African traveller, who obtained the sole specimen.

Sub-family THECLINÆ.

ZEPHYRUS PAYO, de Nicéville. A single specimen taken near Margherita at only four hundred feet elevation. Though a male, it precisely agreed with Mr. de Nicéville's description of the (unique) type, which was very likely also a male, though described as a female.

TICHERRA ACTE, Moore. The very distinct dry-season form, non-ocellate and dusky fuscous below, was first seen in November, as well as that of *Cheritra freja*, while that of *Lexura atynnus* appeared early in October.

DACALANA VIDURA, Horsf. This species, which is rare in Assam, though common in the Malayan region, has the habit of alighting on the underside of leaves (with closed wings), disappearing in the act as if by magic. It is a ground butterfly, living among bushes. *Neomyrina hiemalis*, which alights in precisely the same manner, is on the other hand a tree butterfly, and rarely descends within reach of the net. When flying it strongly resembles the white species of *Cyrestis* and the moths of the genus *Urapteryx*, the latter being apparently a protected group.

Family PAPILIONIDÆ.

PAPILIO (PANGEANOPSIS) *KLEPHENOR*, Doubleday. Two males of this rare species, Dikraing near Sadiya.

PAPILIO (EUPLEOPSIS) *TELEARCHUS*, Hew. The undescribed female of this species appears to be dimorphic, one form resembling the male,

and the other the female, of *Euploea midamus* (linnaei). Both were taken on the Dikrang near Sadiya.

Family HESPERIIDÆ.

Gehlota-group.

GEHIOTA, n. g. I separate *Plesioneura sumitra*, *leucocera* and their allies under this name. The typical *Plesioneura alysos*, Moore (? = *curvifascia*, Felder), is closely allied to *Astictopterus* and *Kerana*. Like them it lies quiet in shady places, flying only now and then, and slowly; alighting with closed wings. The egg, like that of *Kerana*, is of the lowest type among butterflies. It is limpet-like, greatly flattened, red, leathery, nearly smooth (the ribs are visible only near the base), with a broad transparent basal carina. *Sumitra* is on the other hand one of the swiftest and most active of insects, incessantly whirling around flowers, or patrolling up and down a path, almost invisible from the rapidity of its flight. Like its allies of the *Tagiades* group, it alights with open wings. The egg is more than three-fourths as high as wide, generally white, with very numerous (three times as many as in *Tagiades*), sharply cut ribs, and a greatly contracted base without carina. I postpone a comparison of the structure of the imagines.

GEHLOTA PINWILLI, Distant. One male, Margherita, agreeing well with Mr. Distant's description and figure. The species resembles *hypsinia* and other *Cethosias* in colouring. If this is a case of mimicry it has its parallel in that of an *Agarista* only two inches in expanse, which obviously mimics the great Bornean *Hestias*. The enemies of butterflies seem not quite able to grasp the fact that they do not grow.

Snastus-group.

PLASTINGIA MARGHERITA, n. sp., Pl. X, Fig. 5, ♂. MALE, above black, with light golden-ochreous translucent markings, and richer orange-ochreous opaque ones. Of the former there are on the forewing, two unusually large, elongate-quadrate, subapical ones, separated by a vein, the lower longest: one large oblique cellular one of hour-glass shape; and three discal ones in echelon, of which one is very large, occupying the entire breadth of the lower median space, irregularly pentagonal, twice as long as broad, separated from the cell-spot only by the black median vein; the other two smaller, elongate, broadest outwardly. Also with the following opaque markings:—one above the cell and one in the interno-median space, extending obliquely from the internal vein, not far from the base, to the lower median vein, which separates it from the basal part of the larger discal spot. Hindwing with a large irregular

ochreous patch in the disc just beyond the cell, consisting of two translucent areas joined by the opaque orange-ochreous base of the upper median space, the outer one larger, obliquely quadrate, between the lower subcostal and upper median branches, the other occupying the basal part of the lower median space.

Below blackish, the veins, except near the abdominal margin of both wings, widely bordered with reddish-ochreous. *Forewing* with the rufous costal area extending over the upper part of the cell; that in the interno-median space much larger and paler than above. *Hindwing* with a number of lustrous lilac markings in the black spaces between the reddish nerve-rays, namely, two in the cell, the basal one elongate, one at the base of the costa, elongate, two in the upper subcostal space, the outer one elongate, one in the lower subcostal space, quadrate, and three in the median and submedian spaces, in a line reeding from the border. Cilia ochreous.

One male, Margherita, and a similar one, Sadiya. The species is a local form (differing in the large subapical spots, the absence of the outer—fourth—discal spot, the undivided cell-spot separated from the interno-median one, and in the ochreous patch of the hindwing consisting of two hyaline and one opaque space and confined to the disc) of another found in the three Indo-Malayan islands, the Malayan Peninsula, and Mergui, but everywhere rare. The Javanese form (*callineura*) seems, judging from my specimens, to differ but slightly. The single, very worn Mergui specimen, taken by Dr. Anderson, has been identified by Mr. Moore as *Plastingia latoia*, Hewitson. But that species (and *P. callineura*, Felder, which is regarded as conspecific with it) has been described and figured by Hewitson, Felder, and Distant with ochreous submarginal spots on the hindwing below, no blue ones being mentioned. In any case the above-mentioned characters separate my species as a distinct local form.

The egg of several species of *Plastingia* examined by me generally resembles that of *Suastus*. But like those of *Hesperia satwa*, de Nicéville, and the species of *Cupitha*, though in a lesser degree, it possesses a large crown-like mass of white cells apically, surrounding the micropyles, as delicate in structure as the finest lace. They are the most beautiful butterfly-eggs known to me.

Ismene-group.

CAPILA JAYADEVA, Moore. One female, Margherita. I mention this species because according to Mr. Elwes it has never been recorded from anywhere except Sikkim.

Tagiades-group.

SATARUPA NARADA, Moore. Margherita, where *S. bhagava* also occurs.

CALLIANA PIERIDOIDES, Moore. This extraordinary genus and species were described from a single bad specimen without locality, from Grote's Indian and Burmese collections. I obtained several males near Margherita, but no females. They fly in the darkest parts of the forest towards the end of the afternoon,* alighting, like the other butterflies of the *Tagiades* group, with outspread wings. In the morning they lie concealed, adhering closely to the underside of leaves.

No one who sees it floating lazily with level wings up and down the bed of a stream, its pure-white upper surface singularly conspicuous in the gloom of the jungle, can doubt that the species is protected. I see no reason to suppose that it mimics any Pierid. In a very vague way it resembles the geometrid genus *Euchera*, which is likewise protected, and has somewhat similar habits.

The entire body and wings of this butterfly are saturated with a powerful and delicious odour of mingled vanilla and heliotrope. This is often perceptible as it flies past. After pinching the insect, the scent is sometimes obvious for hours afterwards on one's fingers. After lying two weeks in its paper, a dried specimen still gave out perfume. None of the sweet-smelling lepidoptera known to me, not even the *Lethes*, *Eupleas*, or *Callidulas* have a more powerful odour. Yet it seems to have no specialized scent-organs (such as those genera have), unless the tufts on the hind-tibiae, present in many other hesperians, be so considered.

I unluckily caught no female, though I once saw a male circling round a dark-coloured hesperian, which escaped. It is perhaps rash to speculate where certainty may before long be attained, but the female is most likely dark. For the male seems protected only by the intensity of its sweet odour (just as the aromatic herbs of Hymettus and Cyllene, as the shepherds there told me, are protected from cattle by the same pleasant fragrance that attracts the bees), and no female known to me has any sweet odour at all. Odours common to both

* Prof. Wood-Mason tells me that this is a common habit among the *Hesperiadæ*. In Cachar a great many species used to come late every afternoon to visit a certain plant with blue flowers. This seems to me a most interesting fact, illustrating the close relationship between the *Hesperiadæ* and the *Sphinges*. I have never observed anything similar myself, though some of the *Ismenes*, especially the house-haunting sorts like *Parata euronus*, etc., often fly about at sunrise and sunset, alighting on rocks and walls.

sexes are, as in *Agarista*, *Radena*, and *Acræa*, invariably bad. And I know of no case where a female has any peculiar odour of its own.

I add figures of *Remelana yajna* (Himalayas) and *Castalius manluena*, Felder, (Nicobars), described in this Journal in 1886.

EXPLANATION OF PLATE X.

- Fig. 1. *Massaga hartertii*, n. sp., ♂, p. 128.
" 2. *Potamis* (or *Apatura*) *ulupi*, n. sp., ♂, p. 125.
" 3. *Dyctis pealii*, Wood-Mason, ♀, p. 124.
" 4. *Lethe naga*, n. sp., ♀, p. 123.
" 5. *Platingia margherita*, n. sp., ♂, p. 131.
" 6. *Pithecopa fulgens*, n. sp., ♂, p. 127.
" 7. *Remelana yajna*, Doherty, ♂, p. 134.
" 8. *Castalius manluena*, Felder, ♂, p. 134.
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